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EDITORIAL.

Locally-Grown Vegetables.

Recent investigations by this Department and by the Botanic Gardens Department of the Straits Settlements have drawn attention to the value of the edible aroid, known locally as the keladi. A recent article* by Dr. C. X. Furtado of the Gardens Department gave a description of a number of varieties in Malaya and drew attention to the methods of preparing the leaves and tubers for the table. We are indebted to the Gardens Department for the information regarding these varieties which forms an appendix to an article included in this number, written by Mr. E. F. Allen, of the Department of Agriculture, which gives an account of the method of cultivation of the "Keladi China" in many parts of Perak.

Amongst the Chinese the cultivation of keladi is well known, and valued by them not only because it is easily cultivated but as a welcome cash crop. The particular virtue of the crop in their eyes is that it may be successfully grown on wet clay soils and on peaty soils which are unsuitable for other crops. It is appreciated by them also because in a suitable soil certain varieties may be grown under shade and therefore as a catch crop with rubber and coconuts, although it is recognized that for heavy yields full sunlight is necessary.

The Asiatic is fully aware of the value of keladi as a foodstuff, and it may be found offered for sale in any vegetable market in the country. To the European housewife, however, the keladi is, like many other excellent local vegetables entirely unknown.

This ignorance or conservatism on the part of Western nationalities in regard to Eastern food crops is much to be regretted, especially at the present time when conditions are such that the supply of imported foodstuffs is apt to be uncertain and when every effort that can be advocated should be made to make full use of local foods and thereby restrict the imports of other commodities from foreign countries.

In this connexion we welcome a recent leaflet published by the Department of Information, Singapore, entitled "Grow Your Own Food," a collection of practical hints for war-time gardens in Malaya. This 12 page publication, in addition to

* Furtado, C. X. The Malayan Keladis and other Edible Aroids. *M.A.H.A. Magazine*, Vol. X, No. 1, January, 1940.

giving brief information on general methods of cultivation of vegetables includes notes on the cultivation of 33 vegetables and quick-growing fruit crops. Of these there are at least twelve which are rarely if ever eaten by Europeans.

We have mentioned above the failure of Europeans to appreciate the virtues of many local vegetables; we would add that they are not unique in this respect. The official returns show that there are large quantities of many vegetables imported to meet the demand of other non-Malay inhabitants of this country. Many of them may be classed as luxury articles because they are not absolutely necessary in view of the ready supply of a wide variety of local vegetables. We desire, therefore, to urge that greater attention be given to the many excellent vegetables grown in Malaya with the consequent decrease in imported products.

In the course of his work, the Plant Pathologist is frequently called upon to give attention to reports of the outbreak of various diseases of crops and to offer advice regarding treatment. Certain of these investigations are of wider interest than is indicated by the isolated enquiry and yet do not warrant publication of special reports. It is true that much of this information may be found in a very condensed form in annual reports, but many of those interested do not see annual reports, or if they do, would desire fuller information than can be included in that place.

For these reasons we have requested Mr. A. Thompson, Senior Plant Pathologist of this Department, to prepare notes on plant diseases which came to his notice last year, and from previous experience we know that the notes which he has supplied, and which we publish in this number, will be read with interest by many agriculturists not only in Malaya but in other countries.

Legislation regarding the import and export of plants is apt to prove annoying to the general public, because of the uncertainty which exists of the scope of such legislation and the proper procedure to be adopted in order to comply with these rules. The notes which have been compiled and are here published should therefore be convenient for reference and obviate delays which may prove costly in the trade in living plants.

Original Articles.

THE CULTIVATION OF *COLOCASIA ESCULENTA* (L.) SCHOTT. IN MALAYA

BY

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Introduction.

The Malayan keladis are potentially very important food crops which will yield well on damp soil with the minimum of care. Although they are amongst the oldest of cultivated plants and have been grown for centuries in Polynesia, Japan and China they have, until quite recently, been neglected by agriculturists and botanists and their varietal classification and nomenclature are still in a state of confusion. In this paper, which can be regarded only as preliminary, material dealing with the cultivation of this crop has been collected. It should be noted that the information refers chiefly to the cultivation, by Chinese, of the variety known as Keladi China in South Perak.

Distribution.

The species *Colocasia esculenta* (L.) Schott. belongs to the family Araceae and occurs naturally in south-eastern Asia and Malaysia, whence it has spread throughout the tropics. In Malaya the cultivated varieties are known as keladi or, amongst the Indian population, as 'Sepan Kilangu.' It appears to have reached China, Japan and the Philippine Islands at a very early date, while it has been cultivated in Polynesia, under the name of 'Taro' or 'Kalo' since time immemorial. The dispersal westwards apparently occurred somewhat later but it is said to have reached Egypt under the name of 'Colcas' about the time of Christ, whence it spread westwards and was taken either from Spain or from West Africa to America and the West Indies where it is called 'Taro,' 'Eddo,' 'Dasheen,' or 'Malanga'. It probably reached tropical East Africa at about the time of its arrival in Egypt and later spread westwards.

Other local names include 'Gabi' in the Philippines, 'Kandala' and 'Tummasala' in Ceylon, and 'Malombo' in East Africa. The similarity between the last name and the Cuban and Arawak 'Malanga' has led to the suggestion that slaves brought the plant from West Africa to the New World.

Other names for this plant which have appeared in publications apparently owe their origin to confusion with the genus *Xanthosoma*. Thus 'Yautia,' 'Tannia' and 'Habarala' correctly refer to *Xanthosoma* whereas 'Coco Yam' is apparently used for both genera.

Varieties.

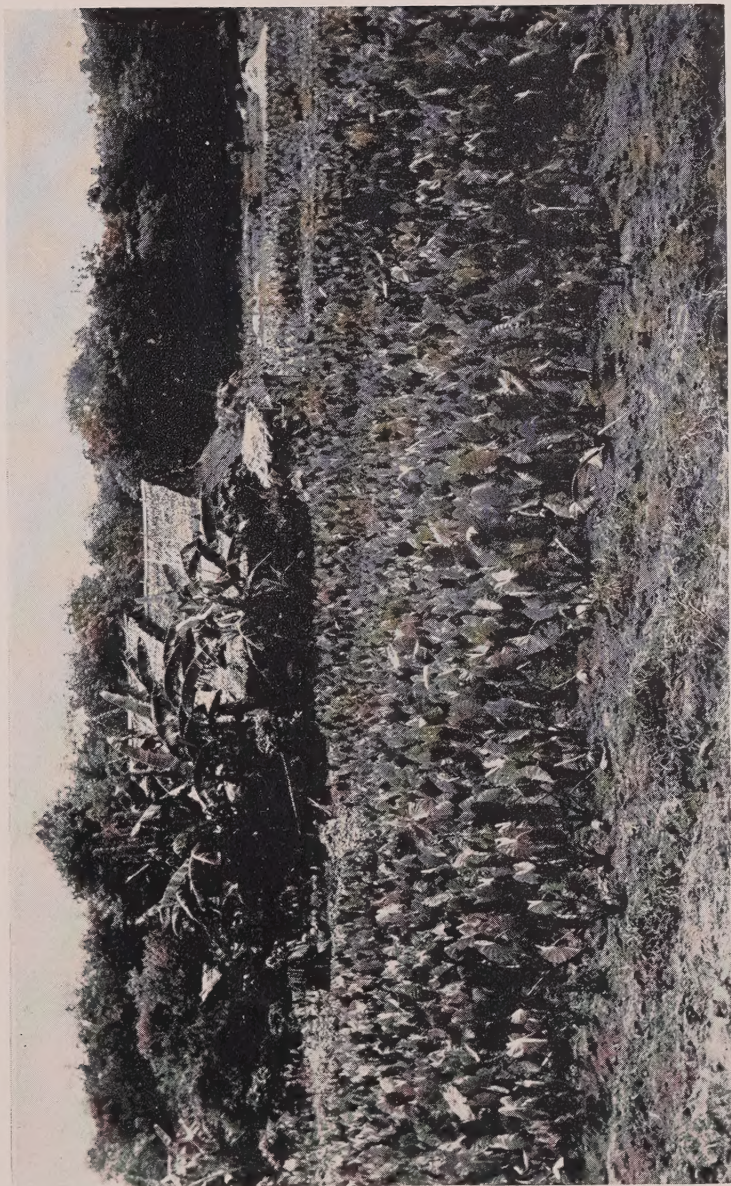
There are, in Malaya, many varieties of keladi although it would seem that synonymy accounts for a much greater number of varietal names than variation justifies. However, in South Perak there are about twenty varieties which are quite commonly cultivated, of which one, Keladi China, is at present by far the most important economically as it is the only variety which is cultivated on a large scale as a cash crop.

Keladi China may be described as a large, erect, herbaceous perennial with large ovate-pellate leaves and cordate leaf-bases. The leaf-blades, 15 to 20 ins. long and 11 to 15 ins. wide, are dark green above and slightly glaucous below. The erect petioles, 3 to 3½ ft. tall, are dark green in colour and pink at the base and at the leaf junction. The large underground tubers (corms), 6 to 12 ins. long, have a dark-brown fibrous covering of scale-leaves and a pinkish skin; the flesh is white, tinged pink near the periphery; protruding buds on the surface of the tuber grow directly into young plants and later produce side tubers. When growing under unsuitable conditions the plant flowers freely. The green pedicels are shorter than the petioles and each bears an orange-buff spathe enclosing a spadix of the same colour.

In addition to Keladi China small quantities of other varieties are frequently cultivated, for home consumption, by Malays who plant this crop along bunds in their rice-fields or in vacant patches in their holdings. These varieties show considerable diversity in size, colour of petiole and leaf-blade, shape of tuber, number and shape of side-tubers, texture and flavour of flesh, presence or absence of stolons, maturation period, presence or absence of irritating crystals in the root and in numerous other characteristics. Very frequently the Malay name gives an indication of varietal differences: thus Keladi Telor has many egg-shaped side tubers; the petioles of Keladi Udang are pink; Keladi Hitam is purplish-black in colour; the leaves of Keladi Minyak are dark green and somewhat oily in appearance; the purple streaks on petioles of Keladi Rakit are all connected laterally to form an irregular mass, and so on. It is hoped to deal with these less important varieties in a subsequent paper as soon as information regarding yields, maturation periods and quality has been accumulated. Preliminary work has already indicated that certain varieties are superior to Keladi China in flavour, although it seems probable that, as in sweet potatoes, the more palatable tubers are inferior in keeping quality. Furthermore many of the superior varieties produce a large number of small side tubers and they are, therefore, less suitable for large-scale planting than Keladi China, of which the large, well-shaped tuber is easily marketable.

A collection of Malayan varieties of keladi and of other edible aroids has been established at the Sungei Manik Agricultural Station in Lower Perak. This collection has been added to from time to time and it has already solved several problems of varietal synonymy and of maturation periods. Particular attention is paid to varieties of economic importance but botanical problems are being dealt with at the Singapore Botanic Gardens where a large collection of aroids has been made by Mr. Holttum and Dr. Furtado.

Plate I.



Keladi China growing in Lower Perak.

Plate II.



Tubers of Keladi China prepared for market and the leaves tied into bundles for transport to pig-sties.

Soils.

Keladi China thrives on the moist alluvial clays of the Perak valley and delta and the crop will certainly grow well on any of the coastal clays. Growth is quite vigorous on peaty soils but yields of tubers are less than on clays. Dry and sandy soils are unsuitable.

This crop would probably respond to irrigation in the dry season.

Propagation.

Young tubers, with a portion of the petioles attached, but with the leaves cut or broken off, are used as planting material by Chinese growers who usually place them on a slight slant with the tubers a few inches deep and the broken petioles just protruding above the ground. Adequate supplies of these young plants are always available wherever Keladi China is grown as they are usually pulled up during routine weeding of the growing crop. Portions of old tubers may also be used for propagation purposes but this method is not normally practised.

Other varieties of keladi may be propagated by side tubers or by the young plants that are formed at the end of creeping runners or stolons.

Cultivation.

Where new land is being opened up for Keladi China it is usually cultivated by 'chankol' (a heavy digging hoe) once or twice and then the crop is planted, on the flat, in rows 4 to 5 ft. apart and at a distance of from 1 to 2 ft. within each row. As the plants grow, earth is piled up to form ridges which may eventually be from 1½ to 2 ft. high. When a second crop is to be grown young suckers are planted near the base of each furrow about three months before the first crop reaches maturity. A great saving in time is thus made and, after the old tubers have been harvested, the soil is levelled and later built up into ridges around the rows of half-grown plants. This method of planting is also adopted when keladi is grown after any other vegetable grown on ridges; it has the double advantage of ensuring an adequate supply of moisture to the young plant and providing cultivation to encourage root and tuber development.

During growth the crop is kept well weeded and all young suckers are pulled up and dead or diseased leaves removed. Weeding operations are usually performed at the same time as the plants are earthed up.

Keladi China is frequently grown as a catch crop with young rubber or coconuts. Under light or medium shade vegetative growth is vigorous but full sun appears to be essential for a reasonable yield of tubers.

Manuring.

It is customary for Chinese growers to apply pig manure at the time of cultivation and, in liquid form, at intervals during the growing period of the crop. The total amount of manure applied cannot be very great and there is some indication that, with Keladi China, cultivation and water supply are factors which limit yield

more frequently than manuring. It is, however, very probable that the varieties which thrive in drier and lighter soils would respond well to heavy applications of manure.

There appears to be no information with regard to the effect of applying artificial fertilizers to Keladi China. Dry-land varieties are said to have responded to potash fertilizers and stable manure in Porto Rico while "unfavorable results were obtained with chemical nitrates and phosphates" (1).

Harvesting and Marketing.

The maturation period of Malayan keladi varieties apparently ranges from about 7 months to 1 year. If the tubers are left in the ground too long they become hard and tasteless, while it would be uneconomic to harvest too soon. Tubers which are immature are often softer and more palatable than older ones but their keeping capacity is less.

Maturation is indicated by a reduction in number of leaves but, as this also occurs in dry weather, a better test is to pull up a few tubers; an immature tuber has a vigorous root-system which dies back at maturity.

Keladi China is usually harvested after 1 year but it appears that it can be harvested after 10 months without a serious reduction in yield. The tubers are pulled out by hand or, in very stiff soils, dug out by 'chankol.' The harvested crop is prepared for market by chopping off the leaves so as to leave from 3 to 6 ins. of petiole bases attached to each tuber. The retailer attaches considerable importance to this point as it enables him to cut a thin slice off the petioles every day in order to give the appearances of recent harvesting; this appearance of freshness is also simulated by dipping the whole tuber in water, a practice which has the additional advantage to the retailer that a certain amount of water absorption results in an increase in weight.

Yields.

A normal commercial crop of Keladi China growing under suitable conditions may be expected to yield from 60 to 70 piculs of tubers (1 ton = 16.8 piculs) per acre but on newly-cleared land it is possible that considerably higher yields would be obtained.

It has already been suggested that yields might show a response to irrigation in the dry season.

In America Taros and Dasheens are said to yield, in favourable conditions, 15 tons or more of tubers per acre. Thus it would seem that there is plenty of room for improvement in methods of keladi cultivation in Malaya, while it is probable that selection will reveal higher-yielding varieties than Keladi China.

Pests and Diseases.

There appear to be no serious pests of keladi varieties in Malaya. The larvae of *Hippotion celerio* L. and of other hawk moths sometimes attack the leaves but they are readily controlled by hand-picking.

The Giant Snail, *Achatina fulica* Fer., also damages keladi leaves but the variety Keladi China is not often attacked. Snails may be controlled by a Meta-bran bait or by hand-collection.

Colocasia Leaf Blight, which results from attack by the fungus *Phytophthora colocasiae* Rac. occurs commonly on all varieties of keladi in Malaya and it also affects the wild Kemahang, *C. esculenta* var. *silvestria*. The leaf symptoms take the form of dark spots which spread by centrifugal growth to form circular or irregular blotches, yellowish-brown in colour, and sporangiophores may sometimes be detected near the periphery of these blotches. In wet weather, or in very damp situations, the fungus may spread to the petioles which become affected by a brown watery rot and collapse. In severe attacks the tubers may become infected by zoospores liberated in the soil from fallen sporangia and, if the tubers are not decayed when the crop is lifted, they may decay in storage and spread the rot to healthy ones stored with them.

Control methods recommended are the removal and, when possible, burning of infected leaves, selection of planting material from healthy crops and crop rotation. The causal fungus occurs on sireh so keladi should not follow this crop. Spraying with Burgundy mixture is said to be beneficial but would probably not be economic. The incidence of this disease could probably be reduced by improved drainage but the yield of Keladi China would almost certainly suffer.

Keladi tubers and petioles are occasionally affected by the fungus *Sclerotium Rolfsii* which causes complete decay. Care should be taken to prevent the spread of this disease by removing the infected plants and those adjacent together with the soil to a depth of 9 ins.; this should then be burnt.

Acridity.

The acidity of all parts of keladi plants has become proverbial amongst the Malays and it is usual to counteract this by cooking the leaves or tubers with an acid ingredient such as tamarind, lime, 'Asam Gelugor' (*Garcinia atroviridis* Griff.) or 'Kelubi' (*Zalacca conferta* Griff.). This acidity is due to the presence of raphides of calcium oxalate which cause intense irritation to all parts of the mucous membrane. It is not very clear how either cooking or the presence of acids too weak to dissolve calcium oxalate counteracts this acidity but it may be due to action on the cell walls which surround each bundle of raphides. The tubers of most commonly-cultivated Keladi varieties are comparatively free from calcium oxalate crystals, except in the peripheral tissues, and any slight acidity which may be present in the fresh tuber disappears after peeling and cooking.

Uses.

A fine-grained starch is, water excepted, the chief constituent of keladi tubers and they form an important article of diet amongst the Asiatic population of Malaya. There are very many ways of cooking the tubers: they may be boiled with salt or sugar; they may be roasted or baked whole; they may be fried in coconut oil; or

they may be cooked in curries. One of the favourite Malay methods is to cut the tubers into small pieces and to cook with "santan" (coconut milk prepared by squeezing the freshly-grated flesh) and sugar.

The tubers of some varieties of keladi are excellent when boiled or baked but those of Keladi China are not at their best when cooked by European methods. However, they may be served as purées or used for thickening soups and stews.

The young leaves and shoots of many keladi varieties may be cooked as a green vegetable but it is difficult to counteract the acidity of most races. The stolons may also be eaten but they possess little flavour.

The leaves and petioles of all varieties of keladi are used by Chinese as pig food and are collected into bundles for this purpose when the tubers are harvested.

Keladi tubers are said to be ill-adapted for starch manufacture as the small size of the starch grains and the presence of a gummy substance prevent the rapid settling of the starch grains in water.

Food made from keladi flour is said to be easily digestible and a sticky fermented paste known as 'Poi' is an important article of diet in Hawaii.

Other Edible Aroids.

The Yautias or Tannias are plants belonging to the American genus *Xanthosoma* and, like keladi, they are important root-crops which have spread throughout the tropics. In Malaya there are two species which are commonly cultivated under the name of Sarawak, Keladi Sarawak or Keladi Batawi, and it is hoped to describe their cultivation in another paper. They differ from keladi in one very important characteristic, namely, that they grow well either in the open or under medium shade.

The rhizome and stem of varieties of *Alocasia macrorrhiza* Schott. (*A. indica* Schott.) are sometimes eaten, after careful preparation, by Javanese and Banjarese resident in Malaya. At least two varieties are known and it is probable that the degree of acidity varies in different races. However, these plants are at present of negligible importance as a food-crop in Malaya.

Many published references to *Alocasia* apparently owe their origin to confusion with *Xanthosoma*, perhaps because of the infrequency with which species of the latter genus flower.

The leaves and petioles of Lambok (*Colocasia gigantea* Hook) are commonly eaten, either raw or cooked, by Malays, and the plant is frequently seen growing under light shade. The wild plant occurs naturally on limestone cliffs in Malaya and it is very acid. The edible race is free from acidity even when raw; apart from a somewhat smaller size it is morphologically identical with the wild plant.

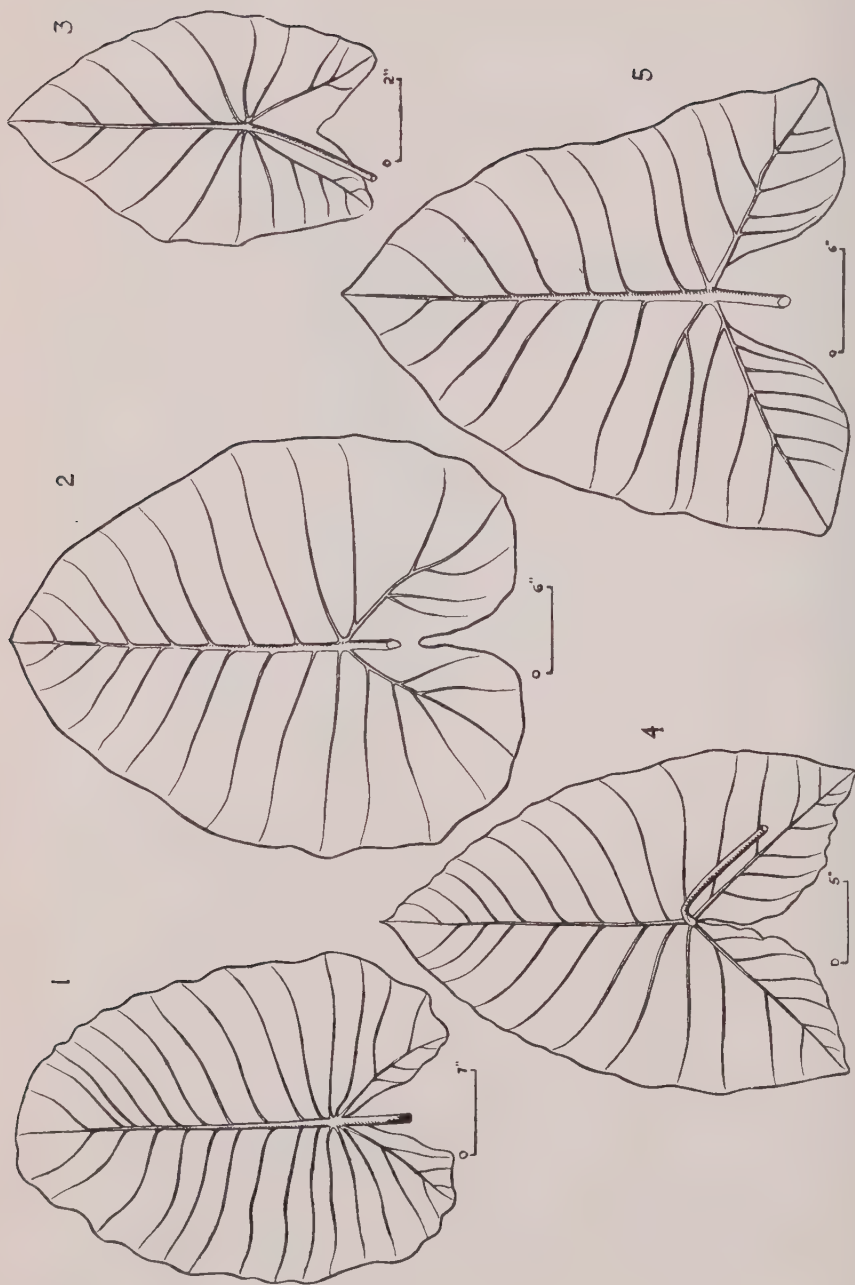
Acknowledgments.

The writer is indebted to Mr. R. E. Holttum, Director of Gardens, S.S. and to Dr. C. X. Furtado for their help in connexion with nomenclature and other problems. The author has also to thank Mr. J. N. Milsum, State Agricultural Officer, Perak, for his constant interest in the work, and Mr. A. Thompson, Senior Plant Pathologist, for his notes on diseases.

Plate III.



Keladi China growing under young rubber in Lower Perak.



Leaf-blades of Cultivated Aroids.

1. *Alocasia macrorrhiza* (Bira).
2. *Colocasia gigantea*
3. *Colocasia esculenta* (Keladi).
4. *Xanthosoma* (Yautia, inferior)
5. *Xanthosoma* (Yautia, superior variety)

References.

1. Barrett, O. W. and Cook, O. F. (1910) Promising Root Crops for the South. U.S. Dept. Agri., Bur. Pl. Ind., Bull. No. 164
2. Burkill, I. H. (1935) A Dictionary of the Economic Products of the Malay Peninsula. Crown Agents for the Colonies, London.
3. Furtado, C. X. (1940) The Malayan Keladis and Other Edible Aroids. *M.A.H.A. Magazine*, Vol. X, p. 11.
4. Molegode, W. (1939) Tannia or the Coco-yam. *Tropical Agriculturist*, Vol. 93, p. 279.
5. Young, R. A. (1935) Article on "Taro" in "The Standard Cyclopedia of Horticulture" edit. Bailey, L. H.

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APPENDIX.

Keladis and Other Edible Aroids.

There are a considerable number of varieties of edible aroids, all with rather large leaves of more or less triangular shape and of superficially similar appearance. They belong to two quite distinct genera, *Colocasia* and *Xanthosoma*, originating respectively in tropical Asia and tropical America; and there is a third genus, *Alocasia*, which is also similar and sometimes also eaten.

Owing to the similarity of these plants, there has been much confusion in naming them; in particular, varieties of *Xanthosoma* have sometimes been called *Alocasia*. This confusion has led to the publication of doubtful or conflicting statements about their edibility and other characters.

In the issue of the *M.A.H.A. Magazine* for January, 1940, Dr. C. X. Furtado has published a general account of keladis, with a comparative description of the edible aroids, including a page of line drawings showing the distinctive leaf characters of the various groups. These drawings are again reproduced here, and the following is a brief summary of the characters of the genera and species concerned.

1. *Colocasia esculenta* (fig 3). The true keladis belong to this species; there are a great variety of races. Most are cultivated for their tuberous stems, but some for the fleshy runners or side shoots, and some for their leaf-stalks or leaves. All contain needle crystals of calcium oxalate, which make them very acrid to the taste when raw, but this acidity is usually destroyed by cooking. The leaf shape, with the stalk attached towards the middle of the leaf, is characteristic. The tip of the blade always points downwards towards the ground.

2. *Colocasia gigantea* (fig. 2). This has a larger leaf than *C. esculenta*, with the points more rounded. The leaf blade is also cut more nearly to the attachment of the stalk. The leaf-stalks and under-surface of the leaves are covered copiously with a white powder. This species is known in Malaya as Lambok or Keladi Ulam. The leaf-stalks are eaten raw or cooked. There appears to be only one cultivated variety. The root stock is prostrate and is not eaten.

3. *Xanthosoma* (figs. 4 & 5). A number of varieties of this tropical American genus have been introduced into the Old World, and a few are common in Malaya. They are grown especially for their side tubers, and are commonly known as Keladi Sarawak or Keladi Betawi. They are easily distinguished from true keladis by the leaf shape, which is more definitely triangular, with strong veins going to the lateral points, and stalk attached at the edge of the blade. There is a possibility of confusion with *Alocasia* but there are clear differences as follows: (i) in *Xanthosoma* the main veins are sunk on the upper surface, in *Alocasia* raised; (ii) the leaf form of *Xanthosoma* is more clearly triangular, with sharp lateral angles; in *Alocasia* the lateral angles are rounded and the veins leading to them weaker; (iii) the leaf blade of *Xanthosoma* is more or less at right angles to the stalk (usually about horizontal), that of *Alocasia* in a straight line with the stalk (almost vertical).

4. *Alocasia* (fig. 1). So far as we know at present, all local *Alocasias* are very acrid, even when cooked, and so are of little use. They are often prominent on waste ground, and are known usually as Bira. The distinctions from *Xanthosoma* are given above.

R. E. H.

NOTES ON PLANT DISEASES IN 1939

BY

A. THOMPSON,

Senior Plant Pathologist.

In these notes the diseases and organisms which have been investigated or recorded on crops during the year 1939 are discussed, and reference is made to activities connected with certain problems which have received attention.

Oil Palms.

Replanting Problems and Stem Diseases.

In connexion with replanting of the older areas of tall palms on certain properties, the problem of disposal of the felled stems has arisen. Burning the stems is practically impossible and burying is somewhat expensive and may encourage termites in areas where harmful termites occur while the practice of allowing the palms to remain on the surface to decay provides breeding facilities for the rhinoceros beetle and red stripe weevil.

Although from the entomological aspect the latter practice is undesirable, it does not seem to present the same danger from the mycological aspect. Areas of felled palms have been under observation for some years and harmful fungi have been observed to develop fructifications only on those palms which were affected with stem-rot prior to felling. Up to now fructifications of *F. noxius* or *G. lucidum* have not been found on stems of felled healthy palms but have developed on felled stems already attacked by these fungi. Such diseased stems decay comparatively rapidly but healthy, felled stems decay slowly and in many cases growth again begins so that cutting out the growing point is necessary.

The fungi which develop most commonly on felled stems are *Poria Ravenalae*, *Polystictus sanguineus*, *Ganoderma applanatum* var. *tornatum* and sundry agarics and myxomycetes.

It has also been found that in healthy stems buried 2 ft. below the soil the major portion of the stem was undecayed two years later but decay proceeded rapidly when the stems were then exposed to the air. Only traces of stem tissue were found, however, in trenches opened up two years after diseased stems were placed therein. The presence of healthy feeding roots of adjacent, growing palms in these trenches further confirmed that, with regard to oil palms, from the root disease aspect it is safe to bury diseased stems affected by *F. noxius*. In view of the fact, however, that *F. noxius* causes brown root disease of woody plants such as rubber, tea and coffee, burial of diseased stems would be dangerous if an oil palm area is to be replanted with a dicotyledenous crop. In this event removal of the stems is indicated.

It was also found that if growing palms are injected with sodium arsenite they are killed in about a week. The stem tissue becomes invaded by yeasts and bacteria and rapidly disintegrates. (Plate 1). A strongly smelling mass of yeast exuded from the injection holes in the stems of a group of palms injected with sodium arsenite powder and the presence of arsenite in the exudate (0.006 per cent. As_2O_3) and in the stem tissue up to the crown (0.005 per cent.) was demonstrated. In spite of the presence of arsenic, larvae of the rhinoceros beetle developed in the decaying tissue of some of these palms, and it would appear necessary to break up the decayed tissue of poisoned stems, so as to destroy the larvae, before the life cycle of the insect is completed. (The life cycle of the rhinoceros beetle is just under 4 months from egg to adult and of the red stripe weevil about 87 days.)

In order to investigate the possibility of replanting an area by felling the old palms, twenty palms in a line on the boundary of a block at the Central Experiment Station, Serdang, were felled by pulling them over after cutting the root system on one side. The stems of some of the palms were mounded with soil up to the crown, others were not mounded. Two of the unmounded palms have died from stem-rot but the remainder have made new upright growth.

Those treated by leaf removal and mounding have made the best progress. (Plate 2). The new root system has not yet been examined.

Leaf Diseases.

(a) Bronzing and yellowing of the older leaves, often combined with orange spotting of the pinnae even of the tips of the younger leaves, is common in certain areas. This trouble was under study during the year and some of the injection methods described by Roach⁽¹⁾ were tried to see if a "deficiency" could be determined. Numerous injections of solutions of chemicals were tried but no results have yet been obtained. Injected solutions appear to travel up the vascular strands but not into the palisade tissue of the pinnae. In addition, trials with deficient culture solutions given to seedlings and young palms growing in sand and in liquid nutrient are in progress, and an experiment in root pruning coupled with manuring has been laid down.

(b) Crown disease was frequently reported from replanted areas and young areas newly opened up. Species of *Fusarium* and bacteria were usually found on the decaying pinnae and, in one instance, the fungus *Vermicularia* was isolated. This fungus did not cause damage when inoculated into pinnae of unaffected palms. The fungus is of the *V. dematium* Fr. type with conspicuous setae and falcate conidia 18 to 24 x 3 to 4 microns and resembles closely *V. capsici* Syd.

Coconuts.

Specimens of coconut roots, collected by Mr. F. C. Cooke, Chemist (Coconut Products), from an area of palms growing in *lalang* grass (*Imperata arundinacea*) were found to be split or penetrated by *lalang* "roots". The presence of *lalang* has an injurious effect on the growth of crops and these interesting specimens suggested that *lalang* might directly injure coconut roots to an extent sufficient to account



Oil palm injected with sodium arsenite near the base showing collapse of the crown 10 days later.



The same palm six weeks later showing collapse of stem.



Oil palm pulled over and stem mounded October, 1938.



The same palm after 8 months, May, 1939.

for the injurious effect. This was found not to be the case in some typical areas inspected. A small amount of direct damage may be caused to coconut roots by "roots" of *lalang* which enter the end of a severed root and grow along within the root often for several feet, or which may penetrate into a root *via* the small holes formed where tiny feeding roots disintegrate and may emerge on the other side, or else grow within the root and lie alongside the central strand, finally rupturing the epidermis (Plate 3). Very few instances of such direct injury were found, however, and in some instances it is probable that the *lalang* "roots" were merely growing inside a coconut root which had been cut during weeding and had died back.

Pineapples.

Bacteria and yeasts obtained from fruits affected with "fruit collapse" were again inoculated into fruits of a clone established from parent plants which had been affected with this disease but without result.

In connexion with "wilt", examination by Mr. R. A. Altson, Plant Pathologist, of the pH of the stem juices (pH 5.4) and of leaf juices (pH 4.2) of healthy and wilted plants of the Singapore Canning variety grown on inland soil in Johore and of healthy plants on peat in Selangor showed no differences between these three categories of plants. The leaf juices of this variety appear to be considerably more acid than those of the Smooth Cayenne variety in Hawaii.

Tea.

Die-back of bushes on the higher land of an estate in Selangor was apparently due to lack of moisture and possibly nutrients, following the rather abnormal prolonged periods of drought experienced during the year. Mortality in tea seedlings planted as seed at stake was also considered to be associated with drought.

An increase in the number of seed bearers killed by *Poria hypolateritia* was noted at the Tanah Rata Agricultural Station, Cameron Highlands, where, however, *Ustilina zonata* is still the most frequent cause of death of bushes and seed bearers.

Rice.

Some observations were made on the trouble called "*penyakit merah*" (red sickness) of rice leaves. There is no evidence of the association of a pathogenic micro-organism with any form of this trouble.

The fungus *Marasmius semiustus* (which attacks banana and Manila hemp leaves) was recorded, for the first time, as the agent responsible for the death of a considerable number of plants of dry land (hill) padi. The fungus caused a decay of the outer leaf sheaths which penetrated inwards at the base and killed the plants. (Plate 4). Plants of *Aframomum*, growing as weeds in the area, were also attacked by the fungus. The attack was undoubtedly influenced by the poor condition of the soil.

A severe attack of *Rhizoctonia* sheath blight, characterized by the development of linear spots on the outer leaf sheaths and later collapse of the leaves, occurred on all the close-planted (5 ins. x 5 ins.) plots of an experiment in Perak. The plots which had received dressings of nitrogenous and phosphatic manures but not potash were affected as extensively as the unmanured plots, but since none of the plots had received potash the effect (on the disease) of including this element must await further trials.

Fruits.

RAMBUTAN. (*Nephelium lappaceum*).

Mildew (*Oidium* sp.) causing a rot of young green fruits and a splitting of maturing fruits was again recorded in Johore on the same trees which were affected in 1938, and was also observed for the first time in Selangor in November. Cross inoculations with the rambutan *Oidium* and *Oidium Heveae* on both host plants did not succeed.

A species of *Phomopsis* hitherto undescribed was associated with a wilt of seedlings and die-back of the scion of buddings. The fungus attacks the middle of the stem of seedlings and rings the bark. The "A" spores of the fungus measure 5 to 8 x 2 to 2.5 microns and the "B" spores are 15 to 20 x 1 to 1.5 microns.

Stem and Branch Disease.—Further isolations were made from tissue of branches affected by bark blistering and hypertrophy. (Plate 4). These included:

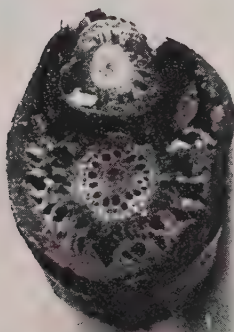
- (a) *Nectria haematococca* Berk and Br. with ascospores measuring 12 to 14 x 5 microns.
- (b) A sooty mould probably *Microxyphium* sp. with black, elongated fructifications about 30 microns broad swelling to about 80 microns near the middle.
- (c) A fungus forming oval pycnidia, at first with colourless walls which become brown or black, and measuring 250 to 300 microns in long diameter and about 150 microns in height. The wall bears numerous, scattered, light-brown setae up to 5 septate, 90 to 180 microns long by 4 microns at the base and slightly taper to near the apex where they curve like the handle of a walking stick or even curve uncinate into a circle. Conidiophores are hyaline, long and branched and form an obconic base to the pycnidium about 50 microns in height. The pycnosporos are one-celled, hyaline, cylindric to sub-allantoid, usually slightly obtuse at the apex and slightly tapering to the base and measure about 6 x 2 microns. The above description was received from Mr. E. W. Mason of the Imperial Mycological Institute who stated that the fungus does not appear to fit into any genus which he can find described.
- (d) *Pestalozzia* sp.
- (e) Bacteria of 2 species.
- (f) Branches of affected trees are also sometimes smothered with a thread-blight fungus.



Roots of coconut split by *lalang* grass.



Living root of coconut penetrated by *lalang* grass.



Cross section of coconut root showing *lalang* "root" growing alongside the central strand



Fructifications of *Marasmius* at base of (dry) rice plants.



Phytophthora fruit-rot of papaya.



Galls on branches of chiku (*Achras sapota*).



Bark diseases of rambutan branches.

All these organisms have been repeatedly inoculated into branches and twigs of healthy trees but without result. The thread blight fungus can spread fairly rapidly by a highly efficient method of dispersal by infected leaves. It has not, up to now, caused bark blistering or hypertrophy but can kill the smaller branches in about nine months after infection.

CITRUS. (*Citrus* spp.)

The fungus *Sclerotium Rolfsii* attacked green shoots of marcotted plants of rough lemon, pomelo and Tahiti lime undergoing etiolation, and caused a rot at the base which killed the shoots and extended into the main branch underground. Watering the soil and painting the branches and the base of the unaffected twigs with Cheshunt compound or colloidal copper checked the disease. It was thought possible that infection came from compost contaminated with the fungus, and that the incidence of the disease was influenced by the immaturity of the young shoots which were green to the base.

CHIKU (*Achras sapota*).

Branches of chiku trees frequently develop galls (Plate 4) which vary in size, according to age, from about $\frac{1}{4}$ in. to 2 ins. in diameter. The galls are not smooth and may be roughly circular or kidney shaped. Older galls usually bear a number of hysterothecia of a *Hysterium* (identified by G. R. Bisby as near to or identical with *H. angustatum* Alt. and Schw.) which is a saprophyte. Cultures from inner tissue of young galls frequently give no growth but occasionally species of bacteria, *Fusarium* sp. and a sterile fungus mycelium have been obtained. In older galls *Pestalozzia* sp. has also been isolated. This species corresponds very closely to a species described by Miss N. Brown⁽²⁾ in 1920 as the cause of sapodilla tumor in Florida. Inoculations have been made on affected and unaffected trees, and on young seedlings, with all the organisms obtained from the galls on chiku but up to now no tumors have developed.

PAPAYA. (*Carica papaya*).

A severe attack of fruit rot (Plate 4) due to *Phytophthora palmivora* (rubber strain) occurred in Taiping during a period of wet weather. The fungus also attacked the trees at soil level causing root and collar rot. In order to prevent the disease from spreading collection and burning of diseased fruits and spraying with Burgundy mixture was undertaken.

Phytophthora parasitica was identified as the cause of a foot-rot of papaya in Johore.

AVOCADO PEAR. (*Persea gratissima*).

It was reported last year that a black line fungus resembling *Ustilina zonata* was associated with *Fomes noxius* in a decay of the roots and collar of avocado. It has now been established that the black line fungus is *Nummularia anthracodes* (Mont.) Cooke var. *gliricidiae* Rehm. (identified by E. W. Mason). In cultures

prepared from the fructifications conidiophores of a *Xylocladium* were formed but it was not established whether these were the conidial stage of the *Nummularia* or whether the *Xylocladium* was parasitizing *Nummularia*.

Cylindrocarpon heteronemum was isolated from the roots of some avocado trees which died back as a result of injury received from an accidental "burning" of the stem by solignum. A species of *Montospora* was isolated from the collar tissue of these trees.

Vegetables.

COLOCASIA.

Plants of keladi (*Colocasia esculenta*) in areas in Perak and Selangor were attacked by leaf blight (*Phytophthora colocasiae*) and in some cases the fungus extended to the corms and caused them to decay. This disease is only likely to be of importance in wet weather and should be controllable by spraying if the need for treatment arises.

Sclerotium Rolfsii also caused a rot of the variety Keladi China and might be troublesome if crop rotation is not adopted.

A leaf disease of *C. gigantea*, characterized by large white blotches on the leaves which may later develop a soft rot, is associated with the fungus *Choanephora (cucurbitaria?)*. The white blotch phase is probably associated with drought and the fungus rot commences when rainy weather follows a long spell of dry weather. The disease is of minor importance.

Spices and Drugs.

Chilli plants affected with die-back due to the fungus *Vermicularia capsici* were received from a number of Agricultural Stations in October. A leaf curl—virus disease—was also fairly common.

Sireh (*Piper Bette*) was attacked by wilt due to *Phytophthora colocasiae* in several areas in Perak and Pahang.

CINCHONA.

An area of cinchona, the tree from which quinine is obtained, was planted at Tanah Rata Agricultural Station, Cameron Highlands, in 1927 and 1929. The two species *C. Ledgeriana* and *C. succirubra* made good growth for some years, but recently *Ledgeriana* in certain areas has begun to die back. The trouble is connected with a shallow, sandy top soil and a stiff subsoil into which the roots do not penetrate. The main root system which runs along the subsoil begins to decay in places and cultures established from the decaying tissue showed that the rot was initiated by the fungus *Phytophthora cinnamomi* Rands. This fungus was first described by Rands in 1922 as the cause of a bark canker of cinnamon in Sumatra but it has not previously been recorded on cinchona. (Identification by S. F. Ashby).

The strain of *P. cinnamomi* on cinchona forms sporangia (sometimes proliferating) in liquid pea juice or soya bean juice cultures. Sporangia range from 40 to 60 x 30 to 40 microns (mean 45.75 x 32.16). Terminal chlamydospores are also

formed in liquid culture and are spherical or sub-spherical with walls 1.5 microns thick. They may occur in clusters on short pedicels and range from 24 to 52 microns in diameter (mean about 36 microns). Oospores were not observed in any of the cultures.

In addition to the partial root-rot there may also occur a decay of the cortex and a canker or splitting of the bark just above and below soil level. Although *P. cinnamomi* causes canker and splitting of the bark of cinnamon trees this fungus has not been isolated from the cinchona bark rot or canker of these trees. A species of *Phomopsis* is often present in the affected cortex but frequently no growth is obtained in culture from this tissue which is soft and mottled with reddish-brown lines.

This species of *Phomopsis* forms the usual oval and filiform "A and B" spores in agar culture. The "A" spores are bi-guttulate 7 to 8 x 2 microns, the "B" spores being about 20 to 25 x 1 micron.

Inoculations of the roots and stem of trees and seedlings with *P. cinnamomi* and *Phomopsis* have shown that the *Phytophthora* is a slowly acting, weak, parasite, but *Phomopsis* appears to be incapable of attacking even wounded tissue. *Phytophthora* did not reproduce the typical symptoms of bark rot and canker and extended so slowly in the stem cortex that only a small area was invaded in a period of 2 months, while in the case of wound inoculations of seedlings a period of 2 to 5 months elapsed before the seedlings were killed.

P. cinnamomi has also been isolated from a wilt of seedlings of *C. succirubra*, *C. ledgeriana* and hybrid (*Succirubra* and *Ledgeriana*) seedlings. The affected plants which came from two areas at Cameron Highlands had all been affected by repeated *Helopeltis* injury to the leaves and were backward. The plants were attacked at the collar by a bark rot and canker and a splitting of the stem to a height of 3 to 9 ins.

Regarding the question of control of the disease in *Ledgeriana* the soil requirements of this species must be taken into consideration. It is well known that in order to grow this species satisfactorily on its own root system, good, rich, deep virgin soil is essential.

C. succirubra, however, has a stronger root system and can be grown over a wider range of soils. This species is growing fairly well at Tanah Rata and forms a suitable stock on which *Ledgeriana* can be grafted and grown with more likelihood of success in areas where it does not do well if grown from seed.

Compost.

The general increased use of compost as a manure has focussed attention on the question of whether disease-causing organisms can be carried in compost. Up to now the only fungus likely to cause disease, which has been observed locally in compost, is *Sclerotium Rolfsii*. Although it is probable that many of the sclerotia of *S. Rolfsii*, which may be introduced into a compost heap on affected plant material, would be killed by the high temperatures reached during the initial fer-

mentation it has been noticed that compost heaps are sometimes heavily infested with this fungus. The use of infected compost has been the cause of mortality of flowering plants in gardens and is suspected to have been the source of infection of citrus shoots as already mentioned.

While further investigation on this question is required it is at present recommended that plants obviously affected by disease should not be included in vegetable refuse used for composting. This applies particularly to plant tissue infected with *S. Rolfsii* which is commonly present on stems of Jerusalem artichoke, oil palm bunch-refuse, crotalaria, groundnut and occasionally on marigold, zinnia, cosmos, coreopsis and tomato.

Miscellaneous Records.

Albizzia moluccana: leaf spot of seedlings, *Pestalozzia* sp.

Galphimia: wilt of two-year old shrubs, slime disease, (*B. solanacearum*).

Avocado: decay of seed, *Xylaria ianthino velutina* Mont.

Rice: spot on glumes, *Pyrenochaete oryzae* Shirai.

Derris: die-back and root decay, *Cylindrocarpon (didymum?)*.

Grass (*Digitaria pseudo-Ischaemum*): smut, *Sorosporium* sp.

Grass (*Digitaria* sp. ?): leaf-spot, *Phyllachora Digitariae* Syd.

Grass (*Sporobolus diander*): flower mould, *Helminthosporium ravenelii* Curtiss.

Sedge (*Cyperus Iria*): rust, *Puccinia Romagnoliana* Maire and Sacc.

Crossandra: wilt, *Phytophthora (parasitica ?)*.

Tea: root disease of highland tea, *Sphaerostilbe repens*.

References.

1. Roach, W. A. Technical Communication No. 10. Imperial Bureau of Horticulture and Plantation Crops. October, 1938.
2. Brown, Miss N. *Phytopathology*, Vol. X, No. 8, August, 1920.

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LEGISLATION IN MALAYA RELATING TO TRADE IN PLANTS

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Introduction.

The following notes, which give a summary of the more important sections of the legislation in force in Malaya at the present time to control the import and export of certain plants, or trade in certain plants, have been compiled for convenience of reference from the notifications in the local official gazettes of rules, and recent amendments thereto, which from time to time have been brought into force under various Ordinances and Enactments.

The objects of the legislation may be briefly stated as follows:—

- (i) To prevent the introduction of plant diseases and pests (Plant Importation Rules).
- (ii) To protect the water-ways (Water-Hyacinth and Noxious Plants Enactments).
- (iii) To implement the terms of the International Rubber Agreement.
- (iv) To implement the terms of the International Tea Agreement.
- (v) To control the trade in deleterious drugs.
- (vi) To provide for the control of the exportation of planting material.

Importation of Plants.

In most countries in the world it is now generally accepted that legislation to control the importation of plants, in order to minimize the risk of introducing plant diseases and pests, is as necessary as legislation designed to prevent the introduction of undesirable diseases of human beings and of animals. For this reason plant importation rules have been in force in all territories in Malaya (except Brunei) for some years, and have, within recent years, been brought up to-date to include control of plant imports carried by aircraft.

Acting on the general principle that such legislation should interfere as little as possible with trade, the rules prohibit, or conditionally prohibit, the importation of only those plants whose introduction it is considered might constitute a danger to established or potential local agricultural industries. Furthermore, the Plant Importation Rules apply only to plants imported from countries outside Malaya so that internal distribution amongst the various States is not hindered.

In the interpretation of the Plant Importation Rules the following definitions are given.

“Plant” includes living plants, flowers, fruits, leaves, roots, tubers, bulbs, stocks, cuttings, layers, slips, suckers and seeds and any parts of plants intended for propagation or from which further plants might be propagated.

“Country of Origin” in relation to a plant means the country in which that plant was growing immediately before its export to Malaya.

“Ports of Entry” for importations by sea are Singapore or Penang (Straits Settlements): Port Swettenham (Federated Malay States): Johore Bahru, Muar, Kota Tinggi (Johore): Alor Star (Kedah): Tumpat (Kelantan). Not specified in the case of the rules in Trengganu and Perlis. For importations by land Koding (rail) and Bukit Kayu Hitam (road) in Kedah.

“Scheduled plants” whose importation is conditionally prohibited are:—

Plants of Para rubber (all species of *Hevea*).

„ „ cotton (all species of *Gossypium*).

„ „ sugar cane (all varieties of *Saccharum Officinarum*).

„ „ palms (all species of *Palmae*).

„ „ coffee (all species of *Coffea*) excluding dried beans for consumption or transhipment.

„ „ all sub-species and varieties of *Musa paradisiaca*, *M. sapientum*, *M. cavendishii* (*M. chinensis*) and *M. textilis* but excluding the fruits (banana).

„ „ tea (all varieties of *Thea sinensis*, *Camellia thea*, *C. sinensis*).

„ „ pineapple (all varieties of *Ananas sativus*) excluding fruits from the Netherlands Indies for consumption or canning.

“Certificate of Health” is a form of General Health Certificate which has been adopted by Colonial Dependencies and which is issued, usually by the Department of Agriculture in the country of origin, and signed by a duly authorized official after inspection of consignments.

Certificates of health signed not more than 14 days before shipment are required in the case of plants whose importation is conditionally prohibited. One copy is sent to the Department of Agriculture and one to the importer who must produce it at the entry port.

Furthermore the written permission of the Department of Agriculture must be obtained before such plants are despatched from the country of origin, and, in addition, the rules provide for the treatment, quarantine, or destruction of consignments by the Inspecting Officers in Malaya if such action is considered necessary.

PLANTS WHOSE IMPORTATION IS PROHIBITED.

1. The importation by aircraft into Malaya from abroad of any plant whatsoever is prohibited, with the following exceptions:—

(1) in the Federated Malay States, Johore and Kedah:

cut flowers from the Netherlands Indies provided that such flowers are not portions of any of the scheduled plants mentioned above and that, in the case of the F.M.S. a permit to import is obtained from the Adviser on Agriculture, and in the case of Johore and Kedah that the flowers are imported only through the ports or aerodromes of Johore Bahru and Alor Star respectively.

(2) in the Straits Settlements :

- (a) cut flowers from the Netherlands Indies as in (1) above under permit issued by the Director of Agriculture, and importation only through the ports or aerodromes of Singapore and Penang.
- (b) the following fresh fruits:—nectarines, peaches, pears, strawberries, plums, raspberries, red and black currants and gooseberries which may be imported through the Civil Airport at Singapore under a permit granted by the Director of Agriculture.

Each consignment of cut flowers or fruits must be accompanied by a certificate of health.

2. The importation of plants of water hyacinth (*Eichhornia (Pontederia) crassipes*) into the Straits Settlements, Johore, Kelantan and Trengganu is prohibited.

PLANTS WHOSE IMPORTATION IS CONDITIONALLY PROHIBITED.

1. With the exception of Trengganu and Perlis the rules prohibit the importation of any plant from abroad except at an entry port.

2. The plants defined above as "scheduled plants" may be imported from abroad only under and in accordance with the conditions of a permit granted by the Director of Agriculture or Chief Field Officer in the case of importations into the Straits Settlements, the Adviser on Agriculture or Chief Field Officer in the case of importations into the Federated Malay States, the respective State Agricultural Officers or the Principal Agricultural Officer in the case of importations into Johore, Kelantan and Kedah, the State Secretary in the case of importations into the State of Trengganu, and the State Council in the case of importations into the State of Perlis.

No restriction is placed upon the movement of scheduled plants within Malaya. Thus planting material that has been imported into say Singapore under permit may be removed to any State or Settlement in Malaya without a further permit being required.

Parcel Post.

With regard to scheduled plants imported by parcel post the rules (excepting Trengganu and Perlis) require that parcels of such plants shall only be imported under permit granted as above and that the parcels shall be addressed to the consignee c/o the Agricultural Officer, Singapore, or Penang in the case of the Straits Settlements, c/o the Adviser on Agriculture or the Chief Field Officer, Department of Agriculture, Kuala Lumpur, in the case of the Federated Malay States, c/o the State Agricultural Officer in Johore and Kelantan, and c/o the Principal Agricultural Officer, Kedah.

Advice of the name of the person for whom the parcel is intended must be sent to the officer to whose care the parcel is addressed and a copy of the certificate of health must be enclosed in the parcel.

PLANTS IN TRANSIT.

In the Straits Settlements and Johore the rules require that plants in transit may not be removed from the aircraft or vessel in which they are carried except with the permission of the Import Officer and subject to such conditions as he may impose.

Exportation of Plants.

RUBBER.

The exportation from Malaya of budwood and seeds of Para rubber (*Hevea brasiliensis*) is prohibited, but, under the relative sections of the Rubber Regulation Enactment or Ordinance, as the case may be, in the Federated Malay States, Straits Settlements, Johore and Kedah, budwood or seeds may be exported to India, Burma, Ceylon, Sarawak, Brunei, British North Borneo, Netherlands Indies, Thailand and French Indo-China on condition that each consignment of budwood or seed so exported is accompanied by a permit signed by the Controller of Rubber, Malaya, and that such permit is returned to the Controller, duly endorsed by the person to whom such budwood or seeds are consigned, within one month of its date of issue.

Similar exceptions have also been gazetted by each of these Administrations to allow for the export of budwood and seeds to other Administrations in Malaya on exactly the same terms, except that in the case of these internal exports the permit must be returned to the Controller duly endorsed within fourteen days of its date of issue.

TEA (*Thea sinensis*, *Camellia thea*, *C. sinensis*).

Seeds of tea may only be exported under and in accordance with the conditions of a permit granted by the Controller appointed under the respective Tea Control Ordinance or Enactment.

TUBA. (*Derris* spp).OIL PALM. (*Elaeis guineensis*).

The export of tuba except in the form of dried root or powder and of oil palm except palm oil, palm kernels, and palm kernel oil is permitted only under and in accordance with the written authority (valid for 90 days) of the Resident of the State concerned in the case of the Federated Malay States (under section 121 of the Customs Enactment 1936) and of the Director of Agriculture in the case of the Straits Settlements, (under section 3 of Ordinance No. 26 of 1939). Legislation on similar lines has been or is being enacted in the individual Unfederated States.

Fees Charged for Inspection and Treatment of Plants and Plant Products Intended for Export.

In the notifications relating to fees charged for this purpose the term "plant" is defined as "any tree, shrub, or vegetable whether living or dead and includes the stem, root, leaf, flower or fruit and any product or part thereof whatsoever whether severed or attached."

The following fees are charged in the Straits Settlements and Federated Malay States for inspections and fumigations performed by Officers of the Department of Agriculture.

Inspection Charges:

					\$
(i)	For the inspection at the office of the Inspecting Officer of cut flowers per 200 stalks or part thereof	...	...	...	.50
(ii)	For inspection at the office of the Inspecting Officer of any package or consignment of plants or plant products (other than cut flowers) weighing 11 lbs. or under	...	...	...	.50 per consignment
	11 to 22 lbs.	...	...	...	1.00 „ „
	exceeding 22 lbs.	...	...	...	5.00 „ „
(iii)	For the inspection of material for export at any place other than the office of the Inspecting Officer or for the inspection of growing crops:				
(a)	not more than 1 hour or part thereof	...			3.00
	„ „ 2 hours „ „	...			6.00
	„ „ 3 „ „	...			9.00
	„ „ 4 „ „	...			12.00
	more than 4 hours but not more than 1 working day	...	...	...	20.00
and (b)	per mile of Inspecting Officer's journey to and from the place of inspection	...	...	...	.20

Fumigation Charges:

- (i) For the fumigation of plants or plant products of a bulk not exceeding the capacity of the fumigatorium 20.00
- (ii) For the fumigation of plants or plant products in the same consignment of a bulk exceeding the capacity of the fumigatorium:
 - (a) For the first filling thereof 20.00
 - (b) For each subsequent filling 15.00

It will be at the discretion of the Inspecting Officer whether a visit to the source of planting material is necessary in addition to inspection of particular consignments. The Adviser on Agriculture may at his discretion waive the charge for inspection in respect of consignments exported to Government Departments and to Scientific Institutions.

Plants in which Trade is Prohibited.

Under the Deleterious Drugs Ordinance and Enactments in the Straits Settlements, Federated and Unfederated Malay States, trade in the following plants is prohibited :—

1. Plants of any species of *Erythroxylaceae* from the leaves of which cocaine can be extracted either directly or by chemical transformation.
2. Plants of *Cannabis sativa* excluding the seeds (seeds are not excluded in the Straits Settlements).
3. Plants of *Papaver somniferum* excluding the seeds.

Exemption is granted to plants mentioned in this section if in transit accompanied by an export authorization or by a diversion certificate.

In this section the term "plant" includes the whole or any part of a plant either living or dead.

Emergency Regulations.

The foregoing summary of legislation deals solely with those regulations in force before the outbreak of war. New regulations have since been introduced as a measure of currency control controlling the importation of a wide range of material, including seeds and certain planting material. As these regulations are of a temporary nature they are not included in this summary. Therefore anyone who contemplates importing planting material is advised to enquire from the Customs Department as to the position.

Received for publication 24th June, 1940.

Notes and Comments.

THE MALAYAN NATURE SOCIETY.

To inaugurate a nature society during a period such as the present when the Empire is so strenuously engaged in the overthrow of a powerful enemy needs a degree of detachment that many may not share with the organizers of the Malayan Nature Society which has just come into being. To inaugurate such a society by the publication of a journal needs courage and a deep conviction that the time is ripe for such a society and that the public response will justify the enthusiasm of its founders. Yet who shall say that the detachment and the courage are misplaced? We cannot, or should not, think of the war all the hours of the day and the night for too great a concentration leads to loss of efficiency. And to distract our minds, to offer a recreation which is a refreshing exercise the study of nature provides opportunities which are unique in that no elaborate instruments have to be purchased and the hobby may be pursued at any time of the day or night.

We may therefore look on the inauguration of the Malayan Nature Society as opportune and wish its founders every success as a reward for their boldness.

The first number of *The Malayan Nature Journal* was published in August and sets a high standard for the excellence and interest of its varied contents. It contains well illustrated articles on such widely different subjects as tailor-birds, caves, an elephant trek, Malayan bears, and a little-known primitive people—the “Che Wong.”

The Society has been formed, we believe, mainly as a result of the enthusiasm of Mr. E. O. Shebbeare, the Chief Game Warden, F.M.S.; the Secretary and Treasurer is Mr. A. T. Edgar, Suffolk Estate, Sitiawan, Perak, and the Editor, Mrs. G. Le Mare, 254, Upper Stephens Road, Taiping, Perak. Information regarding the Society may be obtained from these office-bearers.

FEEDING POULTRY ON HOUSEHOLD SCRAPS.

There are two main systems of keeping poultry under local conditions, namely, the pen system and the free-range system. The system adopted has an important bearing on the method of feeding for whereas in the first-named system the birds are entirely dependent on the food supplied and very great care must therefore be taken to provide a balanced diet, in the free-range system the birds are given a very varied diet of household scraps and supplement this by the food which they pick up.

The free-range system is thus very flexible; feeding costs are low and the system is therefore likely to appeal to the householder whose ambition is limited to the keeping of a small flock to supply his requirements of table birds and eggs for home consumption.

The feeding of poultry under the pen system is discussed in Poultry Leaflet No. 1, which is now in its second edition. A new Leaflet, No. 4, has been published by the Department of Agriculture which deals with the subject of feeding of poultry

on household scraps. This leaflet should be useful at the present time when the thoughts of many are directed to the subject of increasing local production. The Leaflet may be obtained free by residents in Malaya on application to the Department of Agriculture. Leaflets of the Department are intended solely for local distribution and applications from countries outside Malaya cannot be entertained.

MALAYAN AGRICULTURAL STATISTICS 1939.

The first issue of Malayan Agricultural Statistics was published in 1932 and consisted of 63 tables. Subsequent annual publications of these statistics have become progressively more comprehensive, until in the present and ninth issue published as a Special Bulletin, Economic Series No. 11, there are 102 tables and two graphs.

Originally, these statistics were prepared for Departmental use and to assist in replying to the many enquiries of a statistical nature received by the Department. It soon became evident, however, that the publication of these tables would be appreciated in many quarters and the favourable reception extended to each annual issue has fully justified this opinion.

Malayan Agricultural Statistics 1939 provides a review of the areas, production and trade in agricultural products as far back as comprehensive data are available and gives authoritative information of the developments during the year under review. Other tables deal with import and export duties, rainfall and other meteorological data and market prices. Two graphs show the daily market prices in Singapore of rubber and sun-dried copra respectively.

This publication, like its predecessors, should be of value to the administrator, the planter and the business man as a handy book of reference. Copies are available from the Department of Agriculture at the price of \$1 Malayan currency, post free.

Departmental.

FROM THE DISTRICTS.

*Compiled in the Office of the Chief Field Officer from Monthly Reports
of Agricultural Officers.*

August, 1940.

The Weather.

In north-western areas the weather continued dry until towards the end of the month when heavy falls of rain occurred. In Lower Perak, Pahang and throughout the midlands and the south ample rain fell and the total precipitation in most districts was normal for this month. In south Johore and in Singapore there was very heavy rain and the total recorded was much above the average.

Crop Reports.

Rubber.—Prices remained at about the same level, tending to be firmer in some places. Good quality smoked sheet commanded \$44 to \$47 per picul. Uncoupons rubber has been selling at a high price, from \$15 per picul to as much as \$24 per picul being paid.

Mention has been made in previous reports of the widespread and increasing use by small-holders of sulphuric acid as a coagulant, and the quality of rubber containing an excess of this acid deteriorates. It was feared that if this state of affairs was allowed to continue Malaya's reputation as a producer of high quality rubber might be injured; for this reason the Malayan Governments have restricted the importation of sulphuric acid.

Quite considerable stocks of coagulants manufactured from sulphuric acid are held by dealers, so that it will be some time before these become exhausted and the use of acetic acid becomes general.

The State Agricultural Officer, Johore, reports that the special anti-erosion conditions contained in all titles for land recently issued for rubber planting are in most cases being satisfactorily carried out.

Small-holders in Johore have evinced more interest than in some other parts in budding recently-planted holdings. During the past month 207 yds. of budwood of T.J. 1 and 16 have been sold to small-holders from Agricultural Stations in north Johore and 600 yds. in south Johore, and further quantities have been supplied from estates.

Padi.—Dry weather in Kedah, Perak and Province Wellesley has delayed planting. In many instances nurseries have been killed from lack of water and in other cases over-age seedlings have had to be used. Towards the end of the month when heavy rain became general growers were able to proceed with cultivation. Short-term padi seed has been supplied to some areas where nurseries failed.

In Kedah it is reported that rats are remarkably few this year.

In the Sungei Manik area good progress has been made with clearing and planting in Stage I. In Stage II the water supply has been somewhat uneven with the result that clearing and planting have been patchy and rat damage has occurred.

In the Changkat Jong irrigation area land is being given out to Chinese for padi planting; about 2,000 acres have so far been felled. It is hoped to put 47 families into occupation within one week, and each family will own 6 acres. In order to avoid the difficulty of dealing with large numbers of illiterate Chinese, blocks of 60 acres will as far as possible be given out to groups under headmen.

Since the news of the provision of seed padi became general there has been a steady flow of cultivators back to the Panchang Bedena padi area.

Between the 13th and 24th August 25,470 gantangs of seed were distributed. Before receiving seed, each cultivator had to produce satisfactory evidence that he occupied padi land and had to be vouched for by his *ketua* that he would cultivate his holding during the coming season. At 3 gantangs per acre, which was the rate at which this seed was distributed, the above total represents an area of 8,490 acres, approximating to that cultivated in the last successful season 1938-1939.

Rainfall from the 1st to the 24th August was 8.8 ins. and there is ample water for all operations. At the Panchang Bedena Padi Test Station, which adjoins the main drainage canal, the depth of water varies from 6 to 15 ins.

Cultivators have sown nurseries and germination has been satisfactory.

Coconuts.—The price of copra fell still further during August, and at the end of the month stood at \$2.30 per picul for f.m.s. loose in Singapore. In the country districts as little as \$1.40 was being offered, with the result that copra manufacture practically ceased. Many owners of coconut holdings are no longer harvesting the nuts: in some places also owners who have harvested their nuts are unable to find a market for them.

In Labuan the price of copra has fallen to 90 cents per picul.

DEPARTMENTAL NOTES.

Mr. K. B. Jagoe, Botanist, returned from leave on 11th August, 1940.

Mr. G. H. Corbett, Senior Entomologist, S.S. and F.M.S., returned from leave on 28th August, 1940.

Mr. J. A. Baker, Agricultural Officer, returned from leave on 5th September, 1940. He will act as Vice-Principal, School of Agriculture, Malaya, with effect from 6th September, 1940.

Statistical.

MARKET PRICES.

August, 1940.

Major Crops.

Rubber.—There was again little fluctuation in the Singapore rubber market during August. No. 1. X. Ribbed Smoked Sheet was quoted throughout the month between 37 and 37 $\frac{3}{4}$ cents per lb. with the exception of a few days in the first half of the month when the price fell to 36 $\frac{5}{8}$ to 36 $\frac{7}{8}$ cents. The average of daily quotations for the month was 37.33 cents per lb. as compared with 36.77 cents in July. The London average price was 12.84 pence per lb. and New York 19.43 cents gold as compared with 12.41 pence and 21.03 cents gold in July.

Prices paid for small-holders' rubber at three centres during the month are given in Table 1.

Table I.

Weekly Prices Paid by Local Dealers for Small-Holders' Rubber, August, 1940.

(Dollars per picul of 133 1/3 lbs.)

Grades	Kuala Kangsar, Perak				Kuala Pilah, Negri Sembilan					Batu Pahat, Johore.			
	7	14	21	28	1	8	15	22	29	7	14	21	28
Smoked Sheet ...	42.15	44.00	44.00	44.40	43.70	44.50	44.80	45.30	45.50	—	—	—	—
Unsmoked Sheet ...	—	—	—	—	—	—	—	—	—	39.10	40.54	40.25	41.00
Scrap ...	—	—	—	—	—	—	—	—	—	—	—	—	—

Transport by F.M.S.R. lorry service Kuala Pilah to Seremban 12 cents per picul, to Malacca excluding duty, 25 cents per picul, by rail Seremban to Penang \$1.24 per picul, Seremban to Singapore \$8 per ton.

Transport from Batu Pahat to Singapore by lorry, excluding duty, 90 cents per picul.

Transport from Kuala Kangsar to Prai by railway \$6.20 per ton.

At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.

Palm Oil.—No recent advices have been received from London regarding prices paid for Malayan palm oil, and the last recorded price was £17 per ton.

Local sales of palm oil in sellers' drums were made during August at the following prices:— unbleached oil 5 per cent. f.f.a. \$165 per ton f.o.b. Singapore; \$190 per ton c.i.f. Colombo.

Copra.—The market fell heavily from \$2.75 per picul for the sun-dried grade to \$2.30, averaging \$2.43 as compared with \$2.83 in July. The mixed grade was quoted throughout the month 25 cents below the sun-dried grade.

Coconut oil was sold in August in Singapore at an average price of \$7.50 per picul.

Copra cake continued unchanged at \$1.10 per picul.

Rice.—The Singapore average wholesale prices of rice per picul in August were as follows:— Rangoon Parboiled No. 2 \$4.95. There were no dealings in the remaining grades usually quoted in this report.

The June average retail prices per gantang (gallon) of No. 2 Thai rice were: Singapore 28, Penang 30½ as compared with 28 and 29 respectively in May. Malacca is not quoted.

The average declared trade value of imports during June was \$4.29 per picul, as compared with \$4.29 in May and \$4.32 in April.

Padi.—The Government Rice Mills, Perak, are paying a guaranteed price of \$2.50 per picul for padi, plus a bonus of 10 cents per picul for pure strain S.K. 48 padi. The Government Rice Mill, Temerloh, Pahang, continued to pay \$2.25 per picul during August.

Retail prices of padi per 100 gantangs (gallons) were as follows:—Province Wellesley and Penang \$12.50, Selangor \$16 to \$24, Pahang \$10 to \$15, Negri Sembilan \$9 to \$14 (\$16 Seremban), Johore \$15 to \$17, Kedah \$9.20

Pineapples.—Business continues at a standstill, and nominal prices for the canned product and fresh fruit prices remain unchanged.

Beverages.

Tea.—No London prices are available.

The latest Colombo prices available, quoted from *The Ceylon Tea Market Report* of 27th August, 1940, of the Colombo Brokers' Association are as follows in rupee cents per lb.:— High Grown Rs. 1.04, Medium Grown 86, Low Grown 69.

Coffee.—Liberian coffee fell from \$16 per picul to \$15.50 at the close, averaging \$15.88. Excelsa fell from \$14.50 to \$13.50, averaging \$14, and Robusta was quoted throughout the month at \$9 per picul.

The average of highest and lowest quotations in Singapore for Palembang coffee was \$10.10 to \$11.75 per picul, and for Sourabaya coffee \$11.35 to \$13.13. The July average prices were \$10.19 to \$12.81 and \$13.12 to \$15.31 respectively.

Spices.

Arecanuts.—The average of the Singapore Chamber of Commerce quotations per picul, which were stated to be approximate, were:— Best \$6, Medium \$5.71, Mixed \$5.35, as compared with \$4.69, \$4.12 and \$3.62 respectively in July.

The averages of the highest and lowest quotations per picul in Singapore were as follows:— Splits \$3.95 to \$5.80, Red Whole \$4.15 to \$6.15, Sliced \$7.93 to \$10.65, as compared with \$4.56 to \$6.37, \$4.50 to \$6.12 and \$7.96 to \$10.37 respectively in July.

Pepper.—Singapore Black continued unchanged at \$6.50 per picul and Muntok White was unchanged at \$12.50, as compared with July average prices of \$6.75 and \$12.75 respectively. The market for Singapore White continued nominal with no quotations.

Nutmegs.—110's and 80's continued unchanged at the July closing prices of \$21 and \$22 per picul respectively, as compared with the July averages of \$22 and \$23.

Mace.—Siouw continued a nominal market with no quotations. Amboina fell again, weakening to \$36 per picul with an average of \$37.60 as compared with \$44 in July.

Cloves.—Continued a nominal market with no quotations.

Cardamoms.—Green cardamoms were quoted in *The Ceylon Chamber of Commerce Weekly Report* of 19th August, 1940, from Rs. 1.10 to Rs. 1.27 per lb.

Miscellaneous.

Derris.—A revival of demand caused prices to advance, and difficulty was experienced in satisfying the demand for high-grade root. Average prices per picul were as follows:— \$10 to \$11 for root sold on a basis of ether extract, \$20 to \$22 for root with 4 to 5 per cent. rotenone content, rising to \$27 to \$28 for 7 to 9 per cent. rotenone.

Gambier.—Block remained a nominal market with no quotations. No. 1. Cube fell from \$16 to \$14.50 per picul at the close, averaging \$15.70 as compared with \$17 in July.

Sago.—Pearl fell from \$6 per picul to \$5.25, but recovered to close at \$6, averaging \$5.75 as compared with \$6.62 in July. Flour, Sarawak Fair, fell from \$3.50 to \$3.15, averaging \$3.28, against \$4.72 in July.

Tapioca.—Flake Fair and Seed Pearl were quoted throughout the month at \$7 per picul, and Medium Pearl at \$8. The July average prices were \$7.25, \$7.38 and \$8.12 respectively.

Tobacco.—Prices of prepared tobacco per picul in Kelantan during August were: 1st quality \$110 to \$160, 2nd quality \$65 to \$128, 3rd quality \$45 to \$112. In Johore cured leaf ranged from \$15 to \$40 per picul and prepared tobacco from \$40 to \$144. In Selangor cut tobacco was 80 cents to \$1.25 per kati at Sabak Bernam. In Pahang dried leaf was \$22 to \$28 per picul and \$64 to \$96 for cut tobacco. In Negri Sembilan prices for dried leaf were: 1st quality \$20 to \$28, 2nd quality \$15 to \$25, 3rd quality \$12 to \$15. In Penang and Province Wellesley 1st quality was \$35 and 2nd quality \$32.

The above prices are based on London and Singapore daily quotations for rubber, on the Singapore daily prices for copra, on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm oil reports and certain coffee prices are kindly supplied by Guthrie & Co., Ltd., Kuala Lumpur, local palm oil prices by Whittall & Co., Kuala Lumpur, the Singapore prices of imported coffee and arecanuts by Lianqui Trading Company of Singapore, and Singapore derris prices by Hooglandt & Co., Singapore.

1 picul = 133 1/3 lbs. The dollar is fixed at 2s. 4d.

Note.—The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57, Trafalgar Square, London, W.C.2.

FERTILIZER PRICES, SEPTEMBER, 1940.

The following are the prices current for the month of September, 1940, of some of the more important fertilizers.

Product.	Analysis				Price per ton \$
	Nitrogen (N)	Phosphoric Acid (P ₂ O ₅)		Potash (K ₂ O)	
		Soluble	Insoluble		
Sulphate of Ammonia ...	20.6	—	—	—	133.00 (short ton)
Muriate of Potash ...	—	—	—	60	200.00
Superphosphate (concentrated) ...	—	39	—	—	140.00
Superphosphate ...	—	16-18	—	—	75.00
Basic Slag ...	—	16*	—	—	75.00
Rock Phosphate (Christmas Island) ...	—	11*	38‡	—	37.00¶
Lime ...	—	—	—	—	20.00

* Citric soluble.

‡ Total

¶ \$35.00 per ton *ex* warehouse, Singapore.

Supplies of calcium cyanamide, sulphate of potash and rock phosphate (Gafsa) are not available.

Quotations are *ex* warehouse, Port Swettenham, Klang, Singapore and Penang, with the exception of muriate of potash which is *ex* warehouse, Port Swettenham, Klang and Singapore.

MALAYAN AGRICULTURAL EXPORTS, JUNE, 1940.

Product	Net Exports in Tons				
	Year 1939	Jan./June 1939	Jan./June 1940	June 1939	June 1940
Arecanuts ...	38,489	19,984	22,560	4,103	1,957
Coconuts fresh†† ...	97,275†	49,175†	41,600†	9,420	6,123†
Coconut oil‡ ...	61,360	28,358	33,773	4,988	4,369
Copra‡ ...	34,420	11,619	11,107	2,004	8,041
Copra cake ...	10,707	3,810	4,397	758	198
Gambier, all kinds ...	1,572	784	432	23	64*
Palm kernels ...	10,774	5,172	4,725	785	606
Palm oil ...	59,712	22,149	25,692	4,211	5,974
Pineapples, canned ...	65,802	46,695	27,870	8,207	6,019
Rubber¶ ...	361,484¶	153,089¶	260,621¶	22,208¶	44,592¶
Sago,—flour ...	9,583	4,047	3,853	919	2,290
„ —pearl ...	3,883	1,773	1,899	226	368
„ —raw ...	4,435*	2,305*	3,140*	364*	331*
Tapioca,—flake ...	1,068	521	425	67	1*
„ —flour ...	2,706*	1,561*	1,058*	210*	209*
„ —pearl ...	18,277	8,279	7,512	1,318	1,011
Derris ...	1,356	646	681	66	134
†Copra equivalent ...	136,075	58,683	66,820	10,297	15,262

† hundreds in number.

* net imports.

¶ production.

MALAYAN PRODUCTION OF PALM OIL AND KERNELS

(In long tons, as declared by Estates).

Month 1940	Palm Oil			Palm Kernels		
	F.M.S.	U.M.S.	Malaya	F.M.S.	U.M.S.	Malaya
January ...	2,007.6	2,474.0	4,481.6	434.3	497.0	931.3
February ...	1,937.9	1,914.7	3,852.6	411.1	454.0	865.1
March ...	2,081.5	1,895.6	3,977.1	445.3	388.1	833.4
April ...	2,104.3	1,820.7	3,925.0	420.8	370.0	790.8
May ...	2,124.3	2,054.1	4,178.4	414.5	401.0	815.5
June ...	2,128.8	2,696.0	4,824.8	268.6	505.0	773.6
July ...	3,217.7	2,886.4	6,104.1	531.4	529.2	1,060.6
Total ...	15,602.1	15,722.9	31,325.0	2,926.0	3,144.3	6,070.3
Total January to July, 1939 ...	16,003.1	14,977.8	30,980.9	2,872.9	2,469.1	5,342.0
Total for the year 1939 ...	30,157.7	27,215.0	57,372.7	5,639.3	4,533.1	10,172.4

Stocks on estates as at 31st July, 1940, were: palm oil 5,245 tons, palm kernels 2,599 tons.

MALAYAN RUBBER STATISTICS.

ACREAGES OF TAPPABLE RUBBER ACTUALLY TAPPED AND NOT TAPPED ON ESTATES OF 100 ACRES AND OVER,
FOR THE MONTH ENDING 31st JULY, 1940.

STATE OR TERRITORY (1)	Estimated Acreages of Tappable Rubber (9) + (11) (2)	ACREAGES OF TAPPABLE RUBBER NOT TAPPED				Area of tappable rubber never been tapped (b)		Total area not tapped (3) + (5) (c)		TOTAL AREA TAPPED DURING THE MONTH		Area of tappable rubber rested under rotational systems (c)	
		On estates which have entirely ceased tapping		On estates which have partly ceased tapping		Acreage (7)	Percent- age of (7) to (2) (8)	Acreage (9)	Percent- age of (9) to (2) (10)	Average (11)	Percent- age of (11) to (2) (12)	Acreage (13)	Percent- age of (13) to (2) (14)
		Acreage (3)	Percent- age of (3) to (2) (4)	Acreage (5)	Percent- age of (5) to (2) (6)								
S.S.—													
Province Wellesley ...	42,382	114	0.3	8,938	21.1	482	1.1	9,052	21.4	33,330	78.6	7,962	18.8
Malacca ...	114,449	943	0.8	16,101	14.1	1,216	1.1	17,044	14.9	97,405	85.1	23,162	20.2
Penang ...	2,610	nil	nil	817	31.3	55	2.1	817	31.3	1,793	68.7	60	2.3
Singapore ...	30,671	4,524	14.8	5,712	18.6	350	1.1	10,236	33.4	20,435	66.6	3,304	10.8
Total S.S. ...	190,112	5,581	2.9	31,568	16.6	2,103	1.1	37,149	19.5	152,963	80.5	34,488	18.1
F.M.S.—													
Perak ...	279,128	3,027	1.1	34,675	12.4	4,749	1.7	37,702	13.5	241,426	86.5	37,600	13.5
Selangor ...	308,550	2,906	1.0	29,833	8.4	3,818	1.2	28,889	9.4	279,661	90.6	44,082	14.3
Negri Sembilan ...	235,303	4,596	1.8	36,063	14.1	7,176	2.8	40,659	15.9	214,644	84.1	30,480	11.9
Pahang ...	85,127	1,023	1.2	11,172	13.1	3,993	4.7	12,195	14.3	72,932	85.7	8,087	9.5
Total F.M.S. ...	928,108	11,552	1.3	107,893	11.6	19,736	2.1	119,445	12.9	808,663	87.1	120,249	13.0
U.M.S.—													
Johore ...	471,116	8,786	1.9	74,731	15.8	25,999	5.5	83,517	17.7	387,599	82.3	56,444	12.0
Kedah ...	193,100	6,046	3.1	14,557	7.6	5,445	2.8	20,603	10.7	172,497	89.3	34,103	17.7
Kelantan ...	31,001	403	1.3	3,722	12.0	847	2.7	4,125	13.3	26,876	86.7	6,492	20.9
Trengganu (d) ...	4,817	nil	nil	nil	nil	nil	nil	nil	nil	4,817	100.0	1,893	39.3
Perlis (e) ...	1,367	36	2.6	427	31.3	109	8.0	463	33.9	904	66.1	154	11.3
Brunei ...	5,974	nil	nil	1,288	21.6	270	4.5	1,288	21.6	4,686	78.4	1,166	19.5
Total U.M.S. ...	707,375	15,271	2.1	94,725	13.4	32,670	4.6	109,996	15.5	597,379	84.5	100,252	14.2
Total MALAYA ...	1,825,595	32,404	1.8	234,186	12.8	54,509	3.0	266,590	14.6	1,559,005	85.4	254,989	14.0

Notes.—(a) Area out-of-tapping on estates which have partly ceased tapping refers to areas definitely being rested and excludes areas on any tapping round.

(b) The acreage shown in column (7) is included in columns (3) and (5).

(c) Areas of tappable rubber rested under rotational systems are not considered as out-of-tapping and therefore

State or Territory	Stocks at beginning of month 1				Production by Estates of 100 acres and over		Production by Estates of less than 100 acres estimated 2		Imports			Exports including re-exports				Stocks at end of month			Consumption 3	
	Ports	Dealers	Estates of 100 acres and over	during the month	Jan. to July 1940	during the month	Jan. to July 1940	during the month		January to July 1940		January to July 1940		Ports	Dealers	Estates of 100 acres and over	during the month			
								Foreign	Local	Foreign	Local	Foreign	Local					Foreign		Local
MALAY STATES:—	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Federated Malay States	...	7,612	16,531	15,311	96,480	8,927	60,117	Nil	Nil	Nil	Nil	13,836	11,941	103,746	60,100	...	5,894	16,572	138	459
Johore	...	3,138	6,493	6,718	43,394	5,961	37,939	Nil	37	Nil	569	3,637	9,283	25,734	57,731	...	2,670	6,757	...	...
Kedah	...	543	3,487	3,626	23,193	1,553	9,641	Nil	Nil	Nil	Nil	1,897	2,236	13,472	22,087	...	496	3,582	...	...
Perlis	...	35	24	15	111	33	225	Nil	Nil	Nil	Nil	Nil	46	Nil	338	...	37	25	...	...
Kelantan	...	455	490	438	2,743	995	6,947	Nil	Nil	Nil	Nil	230	1,055	1,160	8,440	...	610	483	...	...
Trengganu	...	52	174	174	1,269	378	2,464	Nil	Nil	Nil	Nil	5	329	20	3,786	...	89	156	...	...
Brunei	...	6	59	61	426	84	642	...	...	...	...	...	127	...	1,065	...	16	67	...	...
Total Malay States	...	11,843	27,259	26,344	167,616	17,931	117,975	Nil	37	Nil	569	19,605	26,217	144,132	153,547	...	9,812	27,642	138	459
S. SETTLEMENTS:—	...	2,410	1,420	1,403	8,935	943	5,923	Nil	...	Nil	...	2,593	...	18,394	...	...	1,804	1,387	...	...
Malacca	...	1,705	712	574	3,544	300	1,810	Nil	...	Nil	...	10,069	...	65,166	Nil	...	2,171	705	...	...
Province Wellesley	...	2,225	2,680	10	24	151	95	765	22,825	17,951	145,349	38,293	...	208,335	...	...	2,272	3,682	14	...
Penang	...	5,596	21,910	243	168	1,132	82	546	24,335	128,149	400	Nil	...	Nil	...	12,460	18,336	286	17	117
Singapore	...	...	16	Nil	Nil	18	106	83	...	...	...	...	...	...	...	...	29	Nil	...	...
Labuan	...	7,821	28,721	2,385	2,169	13,762	1,438	9,150	27,625	22,825	146,510	50,755	...	291,895	Nil	14,732	26,022	2,392	17	117
Total Straits Settlements	...	7,821	40,564	28,513	181,378	19,369	127,125	27,625	22,862	146,510	145,918	70,360	26,217	436,027	153,547	14,732	35,834	30,034	155	576
Total Malaya	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

TABLE II
DEALERS' STOCKS, IN DRY TONS 3

Class of Rubber	Federated Malay States	S'pore	Penang	Pro-vice Wellesley	Johore	Kedah
22	23	24	25	26	27	28
DRY RUBBER	4,977	17,028	3,275	3,641	1,915	274
WET RUBBER	917	1,308	407	379	755	222
TOTAL	5,894	18,336	3,682	4,020	2,670	496

TABLE III
FOREIGN EXPORTS

PORTS	For month	Jan. to July
Singapore	49,322	305,996
Penang	14,039	87,438
Port Swettenham.	6,855	41,439
Malacca	144	1,174
MALAYA	70,360	436,027

TABLE IV
DOMESTIC EXPORTS 4

AREA	For month	Jan. to July
Malay States	45,712	296,858
Straits Settlements	3,643	23,285
MALAYA	49,355	320,143

- Notes:—
1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained.
 2. The production of estates of less than 100 acres is estimated from the formula: Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month. + Consumption. i.e., Column (13) + [14] + [17] + [18] + [19] + [20] - [2] - [3] - [4] - [5] - [9] - [10]. For the Straits Settlements the production of estates of less than 100 acres is represented by sales or exports as shown by cess paid.
 3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15% wet sheet, 25% scrap, lump, etc., 40%; stocks elsewhere are in dry weights as reported by the dealers themselves.
 4. Columns (33) and (34) represent exports of rubber subject to regulation which, for Singapore and Penang Islands are represented by sales or exports as shown by cess paid.
 5. All statements are brought up to date monthly, and any inaccuracies that may be disclosed are corrected in the totals; the latest publication therefore, is always the most reliable.
 6. The above, with certain omissions, is the Report published by the Registrar-General of Statistics, S.S. and F.M.S., at Singapore on 24th August, 1940.

METEOROLOGICAL SUMMARY, MALAYA, JULY, 1940.

425

LOCALITY.	AIR TEMPERATURE IN DEGREES FAHRENHEIT						EARTH TEMPERATURE		RAINFALL						BRIGHT SUNSHINE.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
	Means of			Absolute Extremes			At 1 foot	At 4 feet	Total. in. mm.	Most in a day. Amt.	Number of days.				Total. hrs.	Daily Mean.	Per cent.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
	A.	B.	Min.	Mean of A and B	Highest Max.	Lowest Min.					Lowest Max.	Highest Min.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											